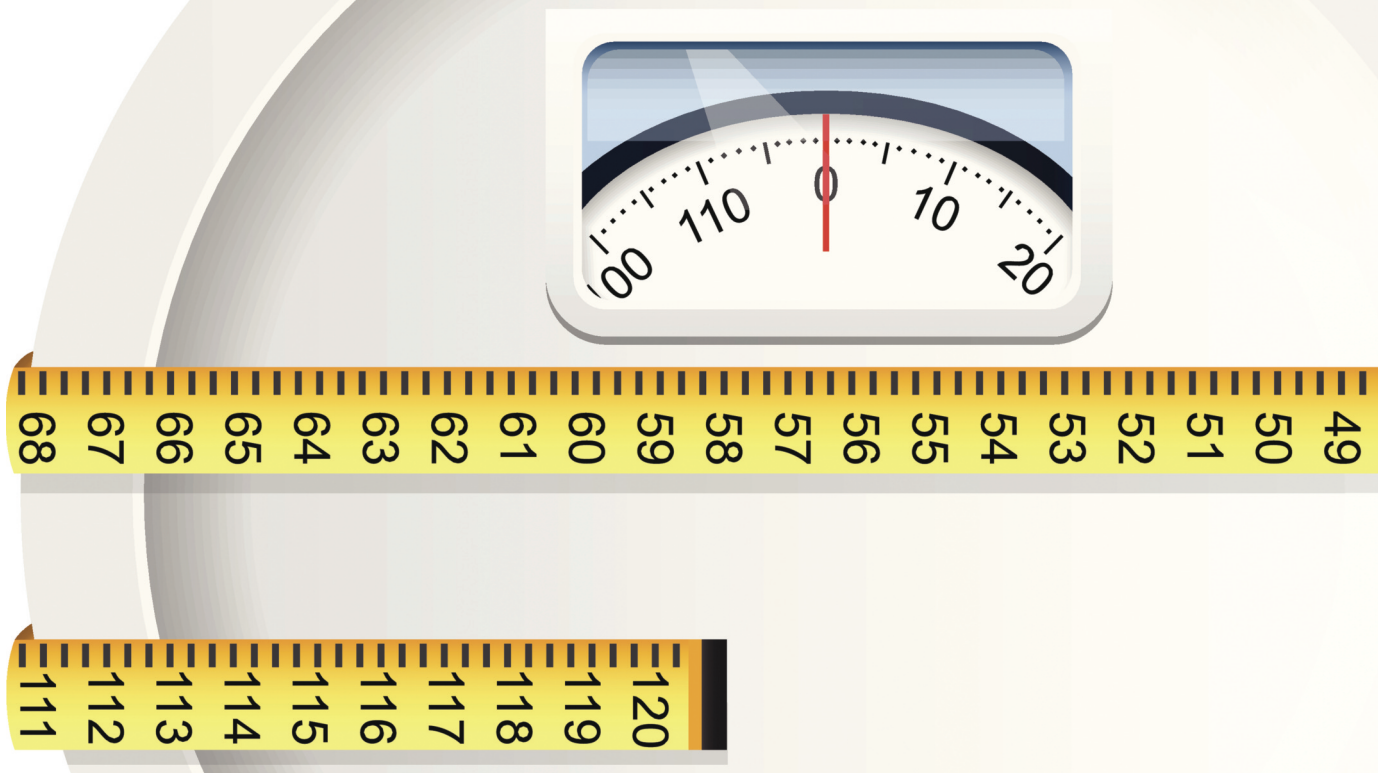

The Use of Meal Replacements in the Obese Haemodialysis Patient

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Obesity continues to be a worldwide concern. The Health and Social Care Information Centre, reported in 2014 that the proportion of adults in England that were overweight, including those obese, increased between 1993 and 2012 from 57.6% to 66.6% among men and from 48.6% to 57.2% among women.[1] Similar trends of obesity are being observed in the chronic kidney disease population, with approximately 48% of our units haemodialysis population having a body mass index (BMI) greater than 25 kg/m^2.

The debate regarding the 'obesity paradox' continues, suggesting individuals on dialysis with a higher BMI have an improved survival and lower mortality rates. This data however may simply be highlighting the risks associated with a low BMI.[2] Nicoletto, *et al.* (2014) suggested that up to the year 2000, obesity was a risk factor for graft loss, death by cardiovascular disease and all cause mortality after kidney transplantation. However, entering the new millennium, it would seem that these health outcomes occur irrespective of the individuals BMI.[3] The clinical practice guidelines published by the UK Renal Association in 2011, suggested that though obese patients can present technical difficulties and are at risk of increased peri-operative complications; obesity is not an absolute contra-indication to transplantation.[4] Khwaja (2012) reported obesity may impact on long-term graft function, but its effects are similar to other co-morbidities such as diabetes, which is not a contra-indication for transplantation.[2] The UK Renal Association also suggest that the beneficial effects of transplantation are lost once a BMI is greater than 40kg/m^2.[2,4]

With a number of haemodialysis patients unable to be assessed for kidney transplantation while their weight is of a BMI greater than 40 kg/m^2, the dietitian has a role in supporting these patients achieve safe and effective weight loss. This is particularly important when evidence suggests that weight loss on dialysis has demonstrated to be a risk factor for patient death independent of the individuals' baseline BMI.[5] Kalantr-Zadeh *et al.* (2010) documented that weight loss with an associated loss in muscle mass was associated with the highest mortality.[6] A recommended weight loss programme needs to ensure that weight lost is adipose tissue rather than lean body tissue, preventing sarcopenia. However, we also need to consider the time it takes to lose weight, with many individuals failing to do so. Noting the increased time on dialysis, whether obese or not, is one of the strongest risk factors for patient death.[5]

The use of meal replacements

Within our unit, we have been trialling the use of meal replacements (MR) to aid weight loss in those individuals with a BMI greater than 40kg/m^2, who have not successfully lost weight following diet manipulation and weight reducing medication. MR are defined as portion-controlled products, fortified with micronutrients, designed to replace one or two meals a day, allowing one meal a day using standard foods, as part of a reduced energy diet.[7] These products have been shown to aid weight loss in a breadth of studies. Evidence has suggested that they are safe, efficient, cost-effective, encourage compliance as well as ensure the total nutrient intake is sufficient if part of a controlled programme.[8] Dietitians in Obesity Management UK (DOM UK)[9] and the American Dietetic Association[10] suggest this is a promising weight loss intervention. However no studies have documented their use in the haemodialysis population.

Due to other considerations, such as potassium, phosphate and fluid, the use of over-the-counter products may not be suitable. Our trial used prescribed 1.5 kcal/ml and high protein (20 g/200 ml) milk-based nutritional supplements as the meal replacement alternative. These products replaced two meals a day, and in combination with one meal from standard food and additional snacks a total 1500 kcal per day was consumed (**Figure 1**). The total protein, potassium and phosphate content of the daily programme were calculated to meet the individuals' needs. Regular activity was also encouraged.

The outcome

Within the past year, six individuals have trialled a meal replacement programme; four of these individuals have been using these products for longer than six months. All patients reported that they struggled with hunger for the first two weeks of the MR programme. However, once that initial period ended the patient felt hunger was

Figure 1: Example Meal Plan

Meal	Calories to aim for	Meal ideas - You can choose one from the list
Breakfast	300 kcal	Meal replacement drink
Mid-morning	100 kcal	Snack, for example: 1 cream cracker and margarine (approx. 62 kcal), 5 bread sticks (approx. 100 kcal), Large apple
Lunch	300 kcal	Meal replacement drink
Mid-afternoon	100 kcal	Snack
Evening meal	600 kcal	For example: 1 medium chicken breast, boiled potatoes 100 g (2 large egg sized), peas 2 tbsp, sweetcorn 2 tbsp
Supper	100 kcal	Snack

Figure 2: 'Patient 1' Weight Changes[13]

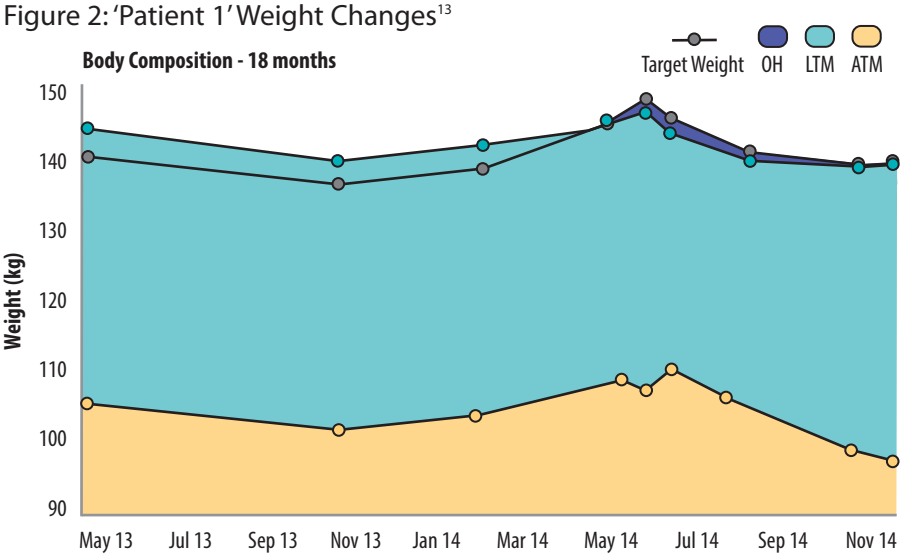

Table One: Weight and Fluid changes of Haemodialysis Patients on MR Programme

	Weight Changes				Fluid Changes	
	Mean results 6 months before MR		Mean results 6 months once MR started		Mean results 6 months before MR	Mean results 6 months once MR started
	Weight (kg)	BMI (kg/m^2)	Weight (kg)	BMI (kg/m^2)	IDFG (L)	IDFG (L)
Patient 1	146.5	43.7	127.5	38.2	3.35	3
Patient 2	129.3	42.2	119.2	39.1	1.93	1.36
Patient 3	128	52.1	122.6	49.1	2.11	2.4
Patient 4	129.8	42.2	117.4	38.3	2	2.23

Table Two: Biochemical Changes of Haemodialysis Patients on MR Programme

	Serum Potassium Changes		Serum Phosphate Changes	
	Mean results 6 months before MR (mmol/l)	Mean results 6 months once MR started (mmol/l)	Mean results 6 months before MR (mmol/l)	Mean results 6 months once MR started (mmol/l)
Patient 1	5.46	5.21	2.36	1.66
Patient 2	5.03	5.22	2.05	1.59
Patient 3	4.94	5.36	2.18	1.82
Patient 4	5.88	6.44	1.9	1.87

supressed making the use of MR easier to manage. Theim *et al.* (2013) conducted a 15-week study using MR to assess the impact on behaviour change and hedonic hunger. Although the study was short-term, and had no control group, the partial MR diet proved to control hedonic hunger. The success may have been due to limited access to foods which improved the dietary behaviour of the patient and resulted in weight loss.[11]

The data we present suggests that significant weight loss (**Table One**) can be achieved when using MR, and that when following the recommended programme biochemical markers (**Table Two**) can remain safe. Inter-dialytic fluid weight gains remain within the recommendations of <4% actual body weight (ABW).[12] 'Patient 4' struggled to comply with diet recommendations, resulting in an increase in serum potassium levels; which resulted in the patient withdrawing from the MR programme after six months.

Bio-impedance was used on a regular basis to ensure dry weight was reduced correctly. It was also used to ensure weight lost was of adipose nature rather than lean tissue. An example of this can be seen in **Figure 2**, which shows the weight changes in 'patient 1'.

The body composition measurement (BCM), as shown in **Figure 2**, illustrates the changes in lean tissue mass (LTM) and adipose tissue mass (ATM).[13] Patient 1 commenced on the MR programme in May 2014. The weight of the patient reduced in the first six months, where ATM significantly declined. BCM readings were not always taken every month. The delay in the reduction of the patients target weight left the patient over hydrated (OH).

Limitations

The patients following the MR programme did not attend the main site dialysis units. Therefore face-to-face contact with the patients was limited. Due to the dietitian only visiting the unit every 3-4 months we relied heavily on telephone consultations. In addition to this, we often found it difficult to achieve the DOM UK guidelines,[9] which recommend reviewing the patient every two weeks. An MDT approach is also recommended by the DOM UK guidelines.[9] Although we strive to work as an MDT, this is not always achievable. All members desire the same outcome of weight loss but, in practice, the support offered in the individual consultation is often led by the dietitian. Having the option of medical, physiotherapy and psychology input may have improved the outcome in some of these patients. For example, the patients remained inactive despite encouragement; a physiotherapist may have improved this outcome.

Though the BMI is an accepted anthropometric measurement for obesity, it has a limited ability to differentiate adipose tissue from lean body tissue. Waist circumference better reflects the intra-abdominal fat when compared to BMI.[14] Posterino *et al.* (2009) documented that waist circumference is a strong, direct, independent predictor of all-cause and cardiovascular death.[15] Although this is a recommended outcome measure, this relates to patients with a BMI <35 kg/m^2 as the practicalities of taking this measurement in patients with a greater BMI is limited. We have relied on the patient reported changes in dress size or notches on belts as a measure of change in waist circumference.

Moving forward

The next stage is to reintroduce foods back into the diet to replace the MR. This MR programme has been a good education tool to show the patient that limiting calories can result in weight loss. We now need to invest time to ensure the patient has confidence and support to make this transition back to normal diet.

Summary

Meal replacements have been shown to promote weight loss in the general population in a safe and effective manner. The numbers of patients we have using MR are only small. Larger studies are required, combining inter-centre data, to look at the outcomes of the use of MR in the haemodialysis population.

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